

### **STATUS OF CLAIMS**

Claims 10 – 33 are pending.  
Claims 10 – 13, 17, 20, and 22 – 31 stand rejected.  
Claim 14 – 16, 18, 19, and 21 stand objected to.  
Claims 32 – 33 have been withdrawn, without prejudice.  
No Claims have been amended.  
New Claims 34 – 39 have been added.

### **REMARKS**

The indication that the subject matter of Claims 14 – 16, 18, 19, and 21 is allowable is gratefully acknowledged.

Reconsideration of the application is respectfully requested.

#### **Amendment to the Specification**

The Claim For Priority section of the Specification has been amended to clarify that the present application is the national stage application under 35 U.S.C. § 371 of the International Application No. PCT/FR2004/050152 filed April 9, 2004. No new matter has been added by this amendment.

#### **Restriction Requirement**

Restriction has been required between Group I (Claims 10 – 31), drawn to a method of making semiconductor granules and Group II (Claims 32 and 33 ), drawn to a method of making semiconductor ingots. Applicant elects Group I (Claims 10 – 31), without traverse. Claims 32 and 33 have been withdrawn without prejudice and

subject to the Applicant's right to reintroduce these claims for prosecution in the present or a new application.

Claim Rejections – 35 U.S.C. § 112

Claim 26 stands rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. More particularly, Claim 26 stands rejected for purportedly containing subject matter which was not described in the specification in such a way as to reasonably convey to one of ordinary skill in the art that the inventor, at the time the application was filed, had possession of the claimed invention. Applicant traverses the rejection for the reasons set forth below. Claim 26 recites that the plate has a thickness of about 1 to 3 mm. As set forth in the Specification, the openings 5 of mould 3 are filled with powders 12. See Specification, Page 4, lines 7 – 8. Powder 12 is compacted by protrusions 18 forming granules 24. See Specification, Page 4, lines 29 – 31; see also, Figs. 2A – 2B and 3. The resulting granule 24 (contained in the mould) has a thickness e smaller than the thickness of mould 3. See Page 5, lines 29 – 32. In other words, thickness of mould 3 is greater than the thickness of granule 24. Since the thickness e of granule is from 1 to 3 millimeters (mm), Page 5, line 31, the thickness of mould 3 would be at least slightly greater than 1 to 3 mm, and therefore, is also in the range of about 1 to 3 mm. Applicant, thus, respectfully submits that the subject matter recited by Claim 26 is supported by the Specification. Accordingly,

reconsideration and removal of this 35 U.S.C. § 112, first paragraph rejection of Claim 26 is respectfully requested.

Claim Rejections – 35 U.S.C. § 102

Claims 10, 12, 13, 18, 20, 24 – 26, and 31 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Stevens (US Patent 5,431,127). Applicant traverses the rejections for at least the following reasons.

35 U.S.C. §102(b) recites:

A person shall be entitled to a patent unless - (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States

Consistently, "a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." See, M.P.E.P. §2131 citing Verdegaaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Stevens fails to teach at least the following step of claim 10: "sintering powders of at least one material selected from the group consisting of silicon, germanium, gallium arsenide, and the alloys thereof so as to form said granules, said sintering step comprising the steps of compacting and thermal processing said powders." (emphasis added). Sintering is defined as "to increase the bonding in a mass of powder or a compact by heating below the melting point of the main constituent." sinter. ASTM (2007), Annual Book of ASTM Standards, Section 2,

Volume 02.05, B243-06, Page 45 (emphasis added). Thus, sintering requires heating without melting. A detailed study of Stevens reveals that in Stevens, the “piles of semiconductor feedstock are then melted briefly to obtain semiconductor particles (30) of uniform mass.” See Abstract. (emphasis added); see also, Col 4, line 63 – Col. 5, line 7 (“...this furnace is heated and brought to a temperature slightly greater than the melting point of the powdered semiconductor feedstock”); see also, Col. 7, lines 13 – 16 (“heating said semiconductor feedstock piles at a temperature sufficient to at least partially melt said feedstock piles to obtain said semiconductor particles”) (emphasis added). Claim 10, on the other hand, requires sintering of semiconductor powders, which process defines heating the powders without melting the powders. Thus, Stevens fails to teach or suggest the sintering step as required by Claim 10. Accordingly, reconsideration and removal of this 35 U.S.C. § 102(b) rejection of Claim 10 is respectfully requested.

Dependent Claims 12, 13, 18, 20, 24 – 26, and 31 depend ultimately from allowable base Claim 10. At least by the virtue of their dependence from Claim 10, and in light of reasons set forth above with regard to Claim 10, Claims 12, 13, 18, 20, 24 – 26, and 31 are also allowable. Accordingly, reconsideration and removal of this 35 U.S.C. § 102(b) rejection of Claims 12, 13, 18, 20, 24 – 26, and 31 is respectfully requested.

Claim Rejections – 35 U.S.C. § 103

Claims 11, 22, 23, and 27 - 30 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Stevens. Applicant respectfully disagrees with and traverses these rejections for at least the following reasons. Dependent Claims 11, 22, 23, and 27 – 30 depend ultimately from an allowable base Claim 10. At least by the virtue of their dependence from Claim 10, and in light of reasons set forth above with regard to Claim 10, Claims 11, 22, 23, and 27 – 30 are also allowable. Accordingly, reconsideration and removal of this 35 U.S.C. § 103(a) rejection of Claims 11, 22, 23, and 27 – 30 is respectfully requested.

New Claims

Claims 34 – 39 have been newly added and recite the subject matter of Claims 14 – 16, 18, 19, and 21, respectively, which stand objected to as being dependent upon a rejected base claim, but are indicated as allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. In particular, newly added Claim 34 recites the subject matter of previously presented Claim 14, rewritten in independent form, and includes all the limitations of the base Claim 10 and the intervening Claim 13. Newly added Claim 35 recites the subject matter of previously presented Claim 15, rewritten in independent form, and includes all the limitations of the base Claim 10. Newly added Claim 36 corresponds to previously presented Claim 16. Newly added Claim 37 recites the subject matter of previously presented Claim 18, rewritten in independent form, and includes all the limitations of the base Claim 10. Likewise,

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Claims 38 and 39 recite the subject matter of previously presented Claims 19 and 21, rewritten in independent form, and include all the limitations of the base Claim 10, respectively. No new matter has been added by these new claims. Thus, newly added Claims 34 – 39 are allowable.

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**CONCLUSION**

Having addressed all outstanding grounds raised by the Examiner, Applicant respectfully submits the present case is in condition for allowance, early notification of which is earnestly solicited.

Should there be any questions or outstanding matters, the Examiner is cordially invited and requested to contact Applicant's undersigned attorney at his number listed below.

Respectfully submitted,



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# ANNUAL BOOK OF ASTM STANDARDS

## 2007

### SECTION 2

#### Nonferrous Metal Products



### VOLUME 02.05

#### Metallic and Inorganic Coatings; Metal Powders and Metal Powder Products



*Includes standards of the following committee(s):*

B08 on Metallic and Inorganic Coatings

B09 on Metal Powders and Metal Powder Products

ASTM Stock Number: S020507

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It develops initial bonds and a pressed compact develops green

#### Classification of Cracks:

**Cracks (rigid die system (RD)), n**—the following definitions apply only to items produced in a rigid die system (RD) as opposed to those cracks produced by other processes, metal injection molding, vacuum hot pressing,

**Crack (RD), n**—generally a planar defect.

**Pre-sinter crack, n**—a defect that occurs prior to sintering.

**Pressing crack, n**—a defect occurring as a result of the pressing operation.

**Interlayer (rupture) crack, n**—a defect that occurs typically at the interface between levels of a multilevel part (occurs during the pressing cycle while powder is transferring from one level to another).

**Relaxation crack, n**—a defect(s) roughly parallel to the direction of the part (these defects usually occur when the compact is compressed to high density and the relaxation forces after pressure release exceed the binding force between the particles).

**Spalling crack, n**—a defect that occurs during the removal of the compact from the tooling (usually occurs in the corners of parts that are not supported uniformly on all lower surfaces).

**Feed shoe crack, n**—a defect or crushed surface caused by the feed shoe or other mechanism removing the compact from the area above the lower punch.

**Pressing crack, n**—a defect that occurs in a green part while it is in the press, and prior to sintering.

**Sintering crack, n**—a defect that occurs during the sintering operation.

**Star crack, n**—typically small defects (star burst) that appear as a bump or blister.

**These may occur during sintering as a result of rapid outgassing of the lubricant. The rapid outgassing may be caused by the amount of lubricant being subjected to an excessive heating rate. Defects may also be caused by "concentrated balls" of lubricant or moisture. During the sintering of the copper base P/M, hydrogen gas from the furnace atmosphere can diffuse into the compact and react with residual oxygen, producing steam that can form cracks. In that industry, this is also called embrittlement, but should not be confused with the hydrogen embrittlement of high strength steels.**

**Differential shrinkage crack, n**—a defect caused by differential shrinkage of a region of a part that has experienced large shrinkage during sintering.

#### Properties of Compacts:

**Green density, n**—the mass per unit volume of an unsintered compact.

**Pressed density, n**—synonymous with green density.

For detailed information on numerous cracks, their location, cause, and prevention, see the handbook published by Metal Powder Industries Federation, Warrendale, Pennsylvania, "The Common Cracks in P/M Compacts" by D. Zenger and

**2503 green expansion, n**—the increase in dimensions of an ejected compact relative to the die dimensions, measured at right angles to the direction of pressing. Synonymous with **springback**.

**xxxx green strength, n**—stress required to break an unsintered compact.

#### 3.2.8 Forging:

**2601 powder forging, n**—densification (generally hot) of a P/M preform by forging.

**DISCUSSION**—In the case in which the preform has been sintered, the process is often referred to as "sinter forging."

**2602 P/F, n**—the acronym for powder forging. See **powder forging**.

**2603 P/M forging, n**—see **powder forging**.

**2605 preform, n**—a P/M compact intended to be changed in shape through deformation and densification.

**2606 sinter forging, n**—see **powder forging**.

**2610 hot upset powder forging, n**—hot densification of a P/M preform by forging where there is a significant amount of lateral material flow.

**2611 hot repress powder forging, n**—hot densification of a P/M preform by forging where the material flow is mainly in the direction of forging.

#### 3.2.9 Metal Injection Molding:

**2701 metal injection molding (MIM), n**—a process in which a mixture of metal powders and a binder system is forced under pressure into a mold. See also **powder injection molding**.

**2702 MIM**—see **metal injection molding**.

**2703 powder injection molding (PIM), n**—a process in which a mixture of powders and a binder system is forced under pressure into a mold. See also **metal injection molding**.

**2704 PIM**—see **powder injection molding**.

**3.3 Sintering**—Terms associated with forming a metallic bond among particles including processes, equipment, and characterization of sintered compacts.

#### 3.3.1 Processes for Sintering:

**3101 sinter, v**—to increase the bonding in a mass of powder or a compact by heating below the melting point of the main constituent.

**3102 solid-state sintering, v**—sintering of a powder or compact without formation of a liquid phase.

**3103 presintering, v**—the heating of a compact at a temperature below the normal final sintering temperature, usually to increase the ease of handling or shaping the compact, or to remove a lubricant or binder before sintering.

**3104 activated sintering, v**—a sintering process during which the rate of sintering is increased, for example, by addition of a substance to the powder or by changing sintering conditions.

**3105 continuous sintering, v**—presintering, or sintering, in such manner that the objects are advanced through the furnace at a fixed rate by manual or mechanical means. Synonymous with **stoking**.

**3106 stoking, v**—see **continuous sintering**.